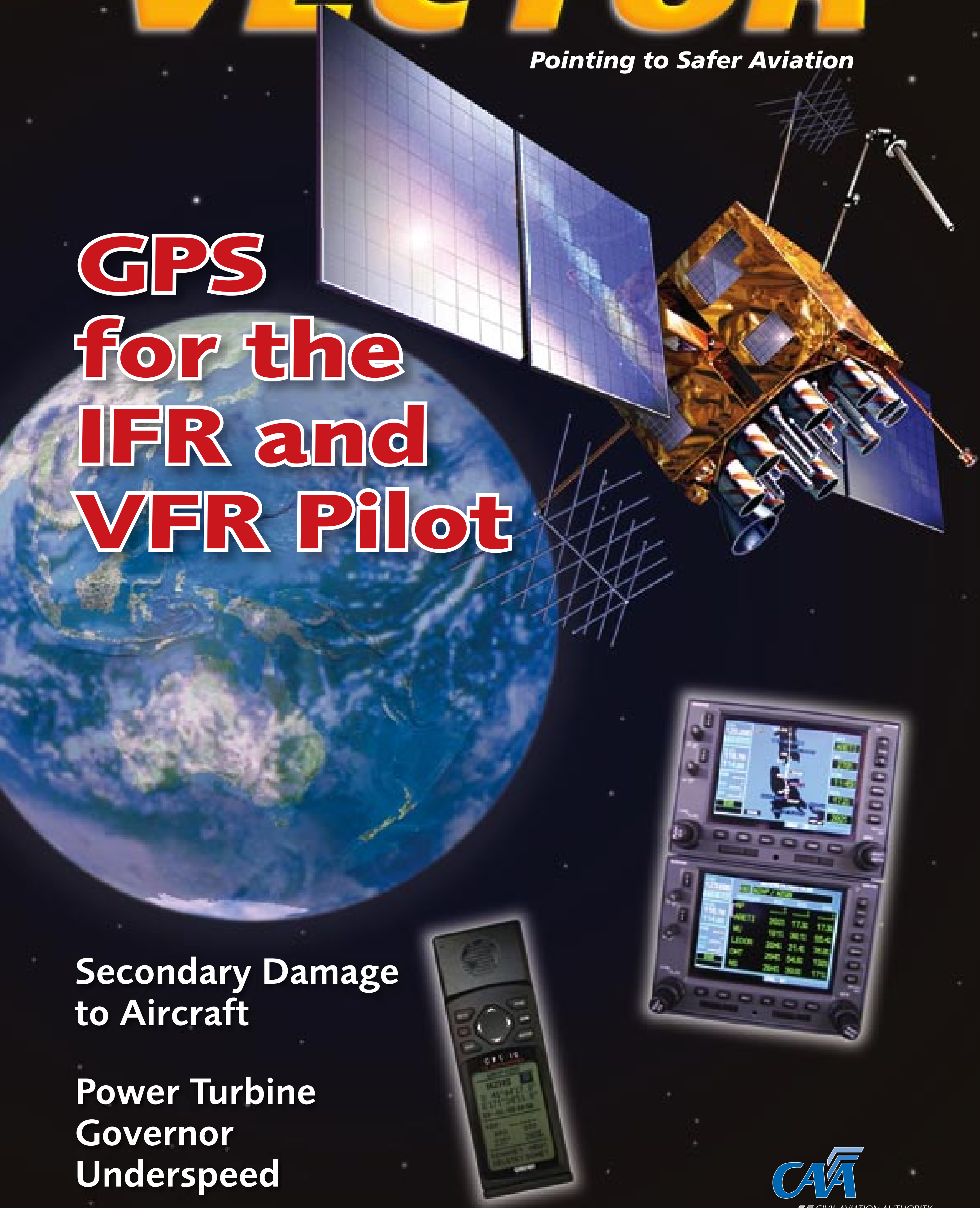
January / February 2005

VECTOR

Pointing to Safer Aviation



GPS for the IFR and VFR Pilot

Secondary Damage to Aircraft

Power Turbine Governor Underspeed

CAA
CIVIL AVIATION AUTHORITY OF NEW ZEALAND

VECTOR CAA NEWS

Published by: the Communications and Safety Education Unit of the Civil Aviation Authority of New Zealand, P O Box 31–441, Lower Hutt, New Zealand. Tel: +64–4–560 9400, Fax: +64–4–569 2024, Email: publications@caa.govt.nz. Published six times a year, in the last week of every odd month.

Manager Communications: Bill Sommer.

Editor: Peter Singleton.

Publishing Team: Gareth Clare, Pam Collings, Cliff Jenks, Peter MacDonald, Jim Rankin, Anna Walkington, Rose Wood.

Design: Gusto Design & Print Ltd.

Publication Content

Unless expressly stated as CAA policy, the views expressed in *Vector/CAA News* do not necessarily reflect the policy of the Civil Aviation Authority. Articles are intended to stimulate discussion and nothing in *Vector/CAA News* is to be taken as overriding any New Zealand Civil Aviation legislation, or any statements issued by the Director of Civil Aviation or the Civil Aviation Authority of New Zealand.

Reader comments and contributions are welcome and may be published, but the Editor reserves the right to edit or abridge them, and not to publish those that are judged not to contribute constructively towards safer aviation. Reader contributions and correspondence regarding the content of *Vector/CAA News* should be addressed to:
publications@caa.govt.nz, or *Vector/CAA News* Editor, P O Box 31–441, Lower Hutt.

Free Distribution

Vector/CAA News is distributed automatically to all New Zealand flight crew, air traffic controllers, aircraft maintenance engineer licence holders, aircraft owners, most organisations holding an aviation document, and to certain other persons and organisations interested in promoting safer aviation. In the case of flight crew and air traffic controllers, a current aviation medical certificate must be held, and a current New Zealand address given, to ensure magazine entitlement. *Vector/CAA News* also appears on the CAA's web site: www.caa.govt.nz.

Change of Address

Readers receiving *Vector/CAA News* free of charge should notify publications@caa.govt.nz of any change of address, quoting your CAA Client Number. Paying subscribers should notify The Colour Guy.

Paid Subscriptions

Vector/CAA News is available on subscription only from The Colour Guy, P O Box 30-464, Lower Hutt, Freephone 0800–438 785.

ISSN 1173-9614

January / February 2005

CONTENTS

This article discusses the use of GPS in the IFR environment and provides some suggestions for single-pilot operations using stand-alone GPS instrument approaches.

Some pilots use handheld GPS as a back-up to VFR navigation. This article covers some basics and offers advice on using your GPS.

The full extent of damage to an aircraft structure caused by an impact may not be immediately obvious. Examples are given to illustrate the point that any damage, however superficial it may appear, should be thoroughly checked by a licensed engineer or an appropriately authorised person before you fly.

ALSO FEATURING

Publications Purchase

0800 GET RULES (0800 438 785) – Civil Aviation Rules, Advisory Circulars, Airworthiness Directives, CAA Logbooks and similar Forms, Flight Instructor's Guide.

www.caa.govt.nz, CAA web site – Civil Aviation Rules, Advisory Circulars, Airworthiness Directives, CAA application forms, CAA reporting forms. (Note that publications and forms on the web site are free of charge.)

0800 500 045, Aviation Publishing – *AIP New Zealand* Volumes 1 to 4 and all charts.

www.aip.net.nz, AIP Online – *AIP New Zealand* is available free on the internet.

GPS for the IFR Pilot

Contributed by Brian J Souter

Pilots have been flying GPS non-precision instrument approaches (NPA) in New Zealand for some time now. Although no problems have been reported yet, it is timely to discuss the use of GPS in the IFR environment.

There is a crossover of important information when using GPS for navigation that is applicable to both IFR and VFR operations (see article in this issue – "GPS for the VFR Pilot").

The Rules

First, let us review the Rule requirements.

The *AIP New Zealand* contains instructions for completing an ICAO Flight Plan Form (Table ENR1.10-1). Under **Item 10: Equipment**, Note 1 says: "Inclusion of the letter G [in the flight plan] indicates that an aircraft meets the conditions and requirements for the use of GNSS [Global Navigation Satellite System] (GPS) equipment."

Equipment approval is noted on the aircraft's 'Aircraft Radio Station Approval' (Form 2129). With the aircraft suitably equipped, pilots must be in compliance with Civil Aviation Rules, Part 19 Subpart D *Transition Rules* and Part 61 Subpart Q *Pilot Licences and Ratings* before carrying out GPS instrument approaches.

If a GPS-equipped aircraft is flown by more than one crew, then it is vital that there is only one agreed standard configuration.

The GPS Display

It is possible to configure GPS displays with many different combinations. Some of the possible readouts in the different data windows are: knots or metres per second; hectopascals or inches; military grid reference system (MGRS) or world geodetic system 84 (WGS 84); degrees Fahrenheit or degrees Celsius; and 12 or 24 hour time. It is essential that pilots adopt a standard display configuration that will give them an identical layout or presentation of the data each time they use their GPS receiver.

If a GPS-equipped aircraft is flown by more than one crew, then it is **vital** that there is **only one** agreed standard configuration. It really doesn't matter what that configuration is, provided all the pilots adopt it. We recommend that crews have a standard display configuration that can be relied upon whenever they use the GPS equipment.

A standard configuration with its associated displays will ensure that there are no surprises.

If you are the only person flying your own aircraft, then by all means customise your GPS receiver display to best suit your individual requirements. (eg, north up, track up or course up when in the 'Map' mode, and so on).

Use of GPS

Many people have implicit faith that GPS signals will always be there when they are wanted. Not so!

There is a well-documented case in which a television antenna with a preamplifier jammed all GPS signals at Moss Landing Harbour, California, for a period of some months before the source of the radio frequency interference (RFI) was discovered in the paint locker of a boat. The interference was restricted to a 1 km radius (approximately), but this was still sufficient to block GPS navigation at the harbour entrance. If the antenna had been omni-directional, it was calculated that the area of jamming could have exceeded a 50 km radius. (Refer www.gpsworld.com/gpsworld, and in the open window at the top left search box, type in "The Hunt for RFI", for the full interesting detective story.)

It has come to the attention of the CAA that some general aviation pilots have been using the on-board GPS to monitor their progress on NDB approaches. When asked which aid they would follow in the event of a 30-degree discrepancy between the ADF bearing and the GPS, the general response has been – "follow the GPS, it's miles more accurate."

Wrong, wrong, wrong! The reply should have been, "Carry out a missed approach and start cross-checking all the data available to establish where the discrepancy lay". Not convinced? The databases, when they first came out for GISBORNE GPS ARRIVAL RWY 14 contained the waypoint, HAWKE. This waypoint was nowhere near Gisborne, but was in fact located in

Continued over ...

... continued from previous page

Australia. The waypoint CREEK for the same GPS arrival RWY 14 was located in Japan.

Blindly following the GPS under these circumstances, would not have been a clever thing to do. The humble old NDB is sometimes a much safer option than following the 'highly accurate' GPS into the side of a hill.

GPS Databases

The databases generally come from one of two sources – direct from Jeppesen, or from the manufacturer of the GPS receiver using data supplied by Jeppesen. Regardless of the source, there have been sufficient errors **to make cross-checking of database information with other sources absolutely imperative**. It should be Standard Operating Procedure (SOP) to do this, and usually involves cross-checking against a hard copy of enroute or area charts, and approach plate tracks and distances, before departure.

A number of operators use computer-generated flight plans. These can also be used for cross-checking (provided, of course, that you can rely on a high standard of quality assurance being applied to the computer flight plans).

A current point of contention is the lack of regulatory requirements for establishing electronic database accuracy and integrity. It is a problem that ICAO has been researching for some time.

Regardless of the GPS database source, cross-check against a hard copy of enroute or area charts, and approach plate tracks and distances, before departure.

GPS Accuracy

Selective availability has now been permanently turned off, and there has been a huge improvement in the accuracy of the GPS navigation solution (see Figure 1). Selective availability was initially turned on by the US Department of Defence to intentionally degrade the accuracy of GPS, so that hostile forces could not use GPS against the USA.

GPS Integrity

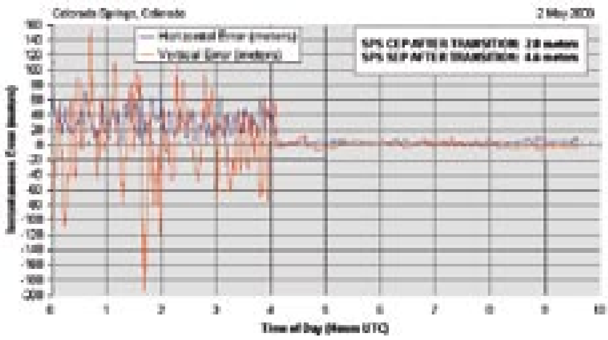
An important distinction is that the accuracy of a GPS position is not a measure of the GPS integrity.

Integrity is the ability of a system to provide timely warnings to the user when the equipment is unreliable for navigation purposes.

Figure 1

GPS Fluctuations Over Time on May 2, 2000

GPS Support Center



This is a plot of GPS navigational errors through the SA transition prepared by Rob Conley of Overlook Systems for the GPS Support Center in Colorado Springs. The GPS errors can be seen diminishing significantly around 0405 UTC (shortly after midnight EDT). The data indicates a circular error of only 2.8 metres and a spherical error of 4.6 metres during the first few hours of selective availability-free operation. The data was measured using a Trimble SV6 receiver.

The following report is from the GPS Support Center run by the US Coast Guard:

"A significant GPS anomaly occurred on 1 January 2004, beginning at approximately 1833Z. The anomaly affected precise timing and navigation users over large portions of Europe, Africa, Asia, Australia, and the far northern reaches of North America.

"The anomaly was due to a failed atomic frequency standard (AFS) on SVN/PRN23 [one of the GPS satellites]. The GPS system relies heavily on the accuracy and stability of its AFS. A failed AFS affects not only precise timing users, but can also significantly degrade navigation accuracy.

"A lack of hard failure indications in satellite telemetry, coupled with satellite visibility limitations in the Master Control Station's L-Band monitor station network made this anomaly difficult to characterise, and resulted in the transmission of Hazardously Misleading Information between approximately 1833Z and 2118Z."

GPS Non-Precision Approaches

Presently, there are 34 published GPS Instrument Approach Procedures (IAP) in New Zealand. These include 15 Kopter GPS IAPs, and the Wanaka IAP which is planned to be published later this year.

Of the 20 fixed-wing GPS IAPs, eight are stand-alone (ie, without alternative approach aids should the GPS approach become unavailable for whatever reason). These include – Ardmore, Greymouth, Hawera, Masterton, North Shore, Tokoroa, Wanaka, and Whitianga.

Within twelve months, three more destinations will be added to this list. These are – Kaitaia, Kerikeri, and Whangarei (see AIC 2/04).

Single-Pilot IFR

The following suggestions for 'single-pilot resource management' may assist those pilots who operate in the **most** challenging of environments – single-pilot IFR.

It is assumed that pilots will make maximum use of the autopilot, allowing them to maintain a monitoring role, rather than a controlling one, and thereby reducing the workload. **Note:** a number of autopilots retain a wing levelling/stability capability even after a vacuum failure and subsequent gyro failure. This is true for autopilots that use the electric turn coordinator for a wings levelling or stability function.

If it is possible for the autopilot 'NAV' function to be coupled to the GPS, workload will be reduced even further (ie, removing the necessity for constant monitoring of the 'stability' mode). In this situation, GPS navigation becomes vastly superior to using terrestrial navigation aids. It is now possible to have smooth transition from one leg of the flight plan to another, rather than having to make the heading changes associated with changing VOR radials. Pilots can, therefore, maintain the monitoring role with minimal control inputs required.

When an IFR alternate is required and has been filed with ATC, a flight plan must also be created (within the GPS) from the intended destination to the filed alternate. A couple of button pushes to activate this flight plan is much less demanding at the end of the missed approach segment than having to create a new plan to your alternate/diversion airfield while flying the aircraft in instrument meteorological conditions.

Stand-alone GPS Instrument Approaches

In the event of extended RAIM warnings (warnings that the integrity of the navigational position solution from GPS satellites may be unreliable), or a total GPS failure, different actions will be required from the pilot depending upon the IAP in question.

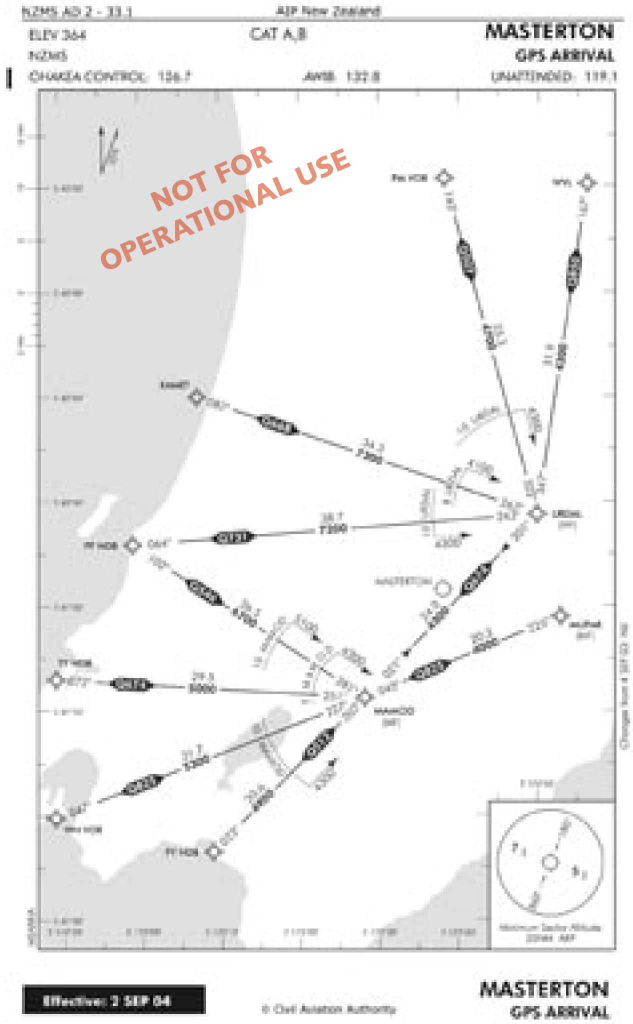
For example, if a RAIM warning occurred during a GPS approach into Ardmore, Auckland radar will still be available to provide required track guidance. Tuning the Auckland radar frequency in the STBY window of your COM radio is basically all that is required.

At Hawera, however, you need to configure your navigation aids in the event that a GPS failure might occur, before commencing the GPS approach. If you are using the GPS Rwy 14 approach, the ADF should be tuned to the Wanganui NDB. Number one NAV should be tuned to New Plymouth VOR, and number two NAV tuned to Ohura. The selection for the DME could be either New Plymouth or Wanganui, depending on whether you plan to proceed to Manga or Mevax reporting points before holding and/or diverting.

At Masterton, if track guidance from the GPS receiver is lost, a climbing left or right turn must be commenced (depending on the direction of flight) – climbing to 5000 feet and tracking to the Ferry NDB. Ferry NDB is suggested, rather than the Palmerston VOR, because of the lower MSA of 4300 feet between Urdal and Mamod reporting points. This compares to an MSA of 4700 feet and the lack of reception from the Palmerston VOR at lower levels in the Wairarapa (see the Masterton GPS Arrival page in the *AIP New Zealand*).

Consider **your** action plan for the other stand-alone GPS Approaches – Greymouth, North Shore, Tokoroa, and Whitianga.

Most KOPTER GPS approaches are stand alone, so the application of the same SOPs as above would be advisable. Northern area helicopter pilots don't need to be warned about database anomalies



that crop up from time to time, because most are aware of how the Mechanics Bay GPS approach was dropped from the database completely.

Summary

Let's review the salient points:

- interference can completely disable the GPS
- GPS satellites can, and do, fail
- GPS databases can contain errors, and data must be cross-checked against other known references
- before commencing a stand-alone GPS approach, it is good airmanship to review your plan of action should the GPS signals or GPS receiver fail, and to configure your available navigation aids for such a possibility.

Your GPS unit is a very powerful navigation tool that can give you answers to a whole host of navigation questions, including the velocity of in-flight winds.

GPS is a wonderful new navigation system, but it can also be a wonderful new way for creating problems.

Know its limitations, use it wisely and enjoy the myriad of benefits on offer. ■

Acknowledgements for their assistance in the preparation of this article:

- *Captain Massey Lynch, Manager Operational Standards, and Captain Shaun Minto, Flight Examiner, of Eagle Airways Limited.*
- *The Digitalis Group, P O Box 1157, Tauranga (Tel: 07–552 5139), who supplied an evaluation copy of their Bendix/King-KLN 90B training CD.*

GPS for the VFR Pilot

Contributed by Brian J Souter

Many pilots are using handheld GPS as a back-up to VFR navigation. If you have recently acquired a handheld GPS, now is a good time to look at the basics, and how to best use this equipment.

The first thing to do is read the Instruction Manual, or Pilot Guide, thoroughly. As with "GPS for the IFR Pilot" (which contains some information that is also relevant for the VFR pilot), the intention of this article is to assist you to prepare an operational plan for the use of your GPS receiver.

Data Displays

There are many possible configurations for displaying data on your GPS, and it is essential that a set display configuration is adopted. This will give you an identical layout or presentation of the data you want, each time you use your GPS receiver. This is particularly important if you allow other pilots to borrow your GPS receiver.

One of the best ways to achieve a standard configuration is to ensure that you know your GPS unit is always in the default mode for your particular configuration. **This is vital.**

Imagine not knowing what map orientation you will get; track-up, north-up, course-up; or that your track and course windows have been transposed. It is suggested that you use **track-up** as the preferred orientation for your moving-map display. This will maintain the left and right relationships between your moving map display and what you see out to your left and right and ahead of the aircraft.

Avoiding Airspace Infringements

Several instances of VFR pilots infringing controlled airspace while using GPS have been recorded.

How you avoid such airspace incursions when using GPS revolves largely around how you use the GPS receiver.

One of the best ways to improve your navigation standards is to get out of the habit of using the **'Direct To'**, or **'Go To'** button. It takes a little more effort, but a multi-leg flight plan can make life a lot easier and contribute to peace of mind when transiting or avoiding complex airspace. Multi-leg flight plans can also take you around high ground which **Direct To** may not do. Additionally, if you encounter bad weather en route, you can go around it, then select **Direct To** an intermediate waypoint on your flight plan to regain your original track.

The safest way to build your flight plan is to use only waypoints that are included within the GPS receiver's Jeppesen database (Airports, VORs, NDBs and reporting points). This greatly reduces the chances for erroneous data entries.

User Waypoints

Although it is always safer to use the Jeppesen database waypoints, all of the waypoints you wish to use may not be included there. This will make it necessary to create **'User'** waypoints. Most GPS units can store at least 100+ User waypoints and for most GPS receivers there are normally three ways to create them:

1. Defining the waypoint using radial and distance from a known waypoint within the database.
2. Capturing your present position and labelling it with a chosen identifier.
3. Entering the appropriate latitude and longitude and labelling it with a chosen identifier.

The first can be very easy to accomplish. From your topographical chart extract the required information and remember the mnemonic **"Place, Bearing and Distance"**.

Is it going to be NZWU, NZWN, NZWR, NZWP, NZWT?

For example, if Pikes Point airfield isn't in the airport database, go into the User database on your GPS receiver and, using the extracted information from the topographical/area/enroute chart, create the waypoint for:

Pikes Point	**Place** – Ardmore	**Bearing** – 289° M	**Distance** – 10 nm	and label it – Pikes Point
Foxpine	**Place** – Palmerston Nth	**Bearing** – 223°M	**Distance** – 19 nm	and label it – Foxpine
Clyde Dam	**Place** – Queenstown	**Bearing** – 095° M	**Distance** – 25 nm	and label it – Clyde Dam
Methven	**Place** – Forest Field	**Bearing** – 223° M	**Distance** – 38 nm	and label it – Methven

... and so on.

For the second method, it is often convenient to capture your present position as a User waypoint. Examples of this would be: when over-flying a friend's airstrip, flying over the corner of an airspace boundary, or to pinpoint an emergency such as a forest fire or a yacht in distress. Once the position is captured, then make sure you assign a label or identifier to it.

The third method is to insert the latitude/longitude for the required User waypoint. This is the only option with some of the earlier handheld GPS receivers. When using this method, get a second person to cross-check your data entries. A number of older GPS receivers with limited databases may not include all the airfields that are in *AIP New Zealand Volume 4*, or on the Visual Navigation Charts.

Be **very** careful when loading latitude/longitude to create User waypoints in your GPS database. It is so easy to transpose the figures (eg, typing in **74** when it should have been **47**). It was a data entry transposition such as this that may have been a causal factor in an Australian fatality. The pilot programmed himself into high ground in restricted visibility on a VFR flight.

It is most important to ensure that the appropriate units are used for latitude and longitude. Most panel-mounted GPS receivers will only accept waypoint latitude and longitude inputs in ***degrees, minutes and decimals of a minute***. To convert decimals of a minute to seconds, multiply the decimals by six (eg, 45° 03.6´S converts to 45° 03´ 36˝S).

Visual Navigation Charts and *AIP New Zealand* use a different format, as does the CAA web site. All latitude and longitude information in these charts or manuals is presented as ***degrees, minutes and seconds***, and the units of measure are not always identified.

Note: If no decimal point is shown, then the units of measure are degrees, minutes and seconds.

On some of the latest moving-map displays (eg, Garmin 430/530) a fourth method of creating a User waypoint is possible – by using the cursor while in the map mode. Place the cursor over the required location and capture the position as a User waypoint. Don't forget to label or place an identifier on the waypoint.

Intermediate Waypoints

A typical flight plan from Taumarunui to Hamilton via Te Kuiti might contain half-way waypoints on each leg. Utilising the User waypoint method of using Place, Bearing, and Distance, you could label each User waypoint as it was constructed:

The first halfway point is NZTM, bearing 328°, and distance 16.5 nm. This could be labelled, for example, TM328/16.5.

The second halfway point is NZTT, bearing 358° and distance 14 nm. This could be labelled TT358/14.

	Track	Distance	G/S	Time
NZTM — TM328/16.5	328° M	16.5 nm	100	10 min
NZTM328/16.5 — NZTT	328° M	16.5 nm	100	10 min
NZTT — TT358/14	358° M	14 nm	110	7.5 min
TT358/14 — NZHN	358° M	14 nm	110	7.5 min
		61 nm		**35 min**

Some handheld GPS receivers may require you to be a little creative in your labelling, due to the limited symbols and space available in the waypoint label field.

Always build your GPS flight plan with a number of intermediate waypoints between departure and destination. Check all the tracks and distances for reasonableness (say, within ±3 degrees and ±3 nm). In this manner you give yourself protection against data entry transposition.

GPS Limitations

Handheld GPS receivers can now be purchased relatively cheaply. Most of the time, the accuracy of these units is similar to those costing 100 times as much. The big difference is that the handheld GPS receivers have no way of giving the user warnings of sub-standard or inaccurate positions. This is what you pay for with a GPS receiver built to a Technical Standard Order (TSO), which requires the GPS receiver to have a RAIM (Receiver Autonomous Integrity Monitor) warning capability. It is for this reason that you must cross-check the accuracy of your tracking using the track lines you've drawn on your Visual Navigation Charts.

Since *selective availability* (see "GPS for IFR Pilots") was turned off on 2 May 2000, the average longitudinal error for many GPS receivers has dropped from 120 metres to less than 10 metres. Note, however, that users of handheld GPS receivers don't know whether they are within 5 metres, 10 metres, or 7 kilometres of their present position because they do not have RAIM warning capability. In all probability it will be the former but there are no guarantees.

Finally...

Note that the use of a GPS receiver does **not** give you an instrument rating. Having a GPS receiver on board is **not** an excuse to push your luck operating in marginal VFR conditions. ■

Secondary Damage to Aircraft

By Ross St George, CAA Field Safety Adviser

This is a reminder for pilots, especially those in the general aviation and microlight sector, that aircraft are fragile structures. Our aircraft look and feel robust, but in order to build them light enough to fly, weight and strength compromises have to be made with materials. There are also inherent weaknesses in the design of components and limitations to the loads that they can be subjected to.

At times the damage caused by an impact may not be immediately obvious. The loads, the stresses, and the forces can be transmitted to other parts of the structure. It is simple physics really – loads from normal and abnormal forces get transmitted through the structure. We may see a dent, or an impact mark on the surface, but can we be sure that that is where the story begins and ends?

Sadly, no. Let's not make this tragically, no.

The certificated air transport sector has lots of checks and balances in place. There are company internal reporting systems for reporting and rectifying all sorts of knocks, bumps and scratches to aircraft. There may even be 'g-meters' to record and report an airframe structural 'exceedance', or an overweight landing and so on. There is close inspection of the aircraft airframe and engineering advice is on hand or on call.

With general aviation aircraft, the reality is quite different. If our aircraft get a nudge and a ding, or we suspect some other possible structural damage from a heavy landing for example, it is up to the pilot-in-command to initially assess and decide. The questions are often in the nature of: "Is this serious?", "Who should I tell now?", "Should I tell anyone now?", "Should I finish the job first?"

The fibreglass landing gear leg with a very noticeable longitudinal crack in it which began under the sleeve. The crack was large enough that a key could be inserted into the upper end of the crack.

Case Studies from the Field Safety Adviser File

The Case of the Slightly Leaning Microlight

The leaning has nothing to do with engine handling. The microlight in question, when sitting on level ground, had a small but discernable lean when viewed from the front and rear. It was less apparent while taxiing. It had been like this for some time.

This aircraft was a two-seat tandem configuration, not a side-by-side seating machine, so the pilot or passenger weight on one side was not the cause. When sitting empty, it just seemed to lean. Possibly the lean was easy to dismiss as: "well, maybe the ground wasn't level", or "maybe a very under-inflated tyre" or whatever.

The aircraft had an Annual Inspection Certificate, and another was due. This it duly had, but the lean persisted. Subsequent to this inspection, another authorised inspector of microlights, who was concerned about this lean, intervened and dug deeper into this matter with the owner.

The story then came out about "maybe a heavy landing some time ago". The owner was persuaded to remove the landing gear attachment leg in question. This included the removal of a covering sleeve. Surprise, Surprise! The fibreglass leg had a very noticeable longitudinal crack in it which began under the sleeve. As can be seen from the photograph, a key could be inserted into the upper end of the crack, and it can also be seen that the crack, or material failure, is propagating down the leg.

The leg end with the crack failure was embedded into the fuselage and under a sleeve fairing. At the time of the inspection and removal, the propagating crack was just making itself visible on the exposed part of the leg.

The concern of the owner and the vigilance of an authorised inspector for the issuing of a microlight Annual Condition Inspection saved us from a nasty incident, or potentially fatal accident. Had part of the leg and wheel separated at a critical point in the takeoff or landing, the microlight is likely to have 'wrapped itself into a ball'. Had it become airborne after having lost a leg and wheel (assuming no other structural damage on departure) the pilot would have had the unenviable prospect of a two-point landing, with the same 'flip over and roll-up' potential. The undercarriage legs on the microlight were replaced with 'heavy-duty' legs.

The Case of the Rearranged Tailplane

On an informal visit to an engineering workshop, a tailplane was observed sitting on trestles, bearing the scars of some fairly serious 'battle damage' to the righthand leading edge. Local knowledge of the colour scheme (and relatively unique tailplane form) identified the aircraft as a particular agricultural aircraft. A friendly chat with the operator was in order, to get the matter reported and tidied up. This is where the story took on a complexion relevant to this article.

Damaged tailplane from the agricultural aircraft.

The aircraft in question had been well away from its base and owner/operator. In the course of the operations by another pilot, the tailplane had obviously struck something with considerable force. The leading edge had been torn, deformed, and bent back to the spar element in the tailplane. It could not be ascertained conclusively what the tailplane had struck to cause the damage.

The damage to the tailplane was first noticed during refuelling, and in the daily flight record was noted as "stone damage". The pilot and loader driver present tested the integrity of the structure by pulling it backwards and forwards and up and down. The structure appeared to be 'firm'. As the wind had risen, preventing further agricultural operations that day, the aircraft was flown to an aerodrome. At this aerodrome persons with engineering backgrounds undertook an external visual inspection of the aircraft. However, no panels or fairings were removed to aid an internal inspection. From this external inspection, the aircraft was deemed 'safe' and the agricultural operations were continued over a number of days until the job was completed. On completion of the contracted work, the aircraft was then ferried some considerable distance back to its home base and landed on a nearby airstrip. Shortly thereafter, the owner flew the aircraft to an adjacent strip. On takeoff, he immediately felt that the controls were heavy and sluggish.

The engineer responsible for the aircraft immediately opened up and removed the tailplane structure. It was found that the starboard (right) mounting bracket of the tailplane had shorn off completely, and that the port mounting bracket was 'holding on' by one attachment rivet.

Further inspection on the tailplane revealed that the starboard mounting bracket (on the left in this photograph) had shorn off completely, and that the port mounting bracket was 'holding on' by one attachment rivet.

What was holding much of the structure together were the forward fairings between the tailplane and the fuselage and the associated Silafex. How long before the aircraft shed its tailplane, or had it move sufficiently to jam, or significantly disrupt the controls, we fortunately don't know.

The internal damage was not externally obvious, and apparently the structure 'felt' okay, but as with the cracked undercarriage leg, looks can be deceiving.

The Lessons

As the principal engineer involved with the maintenance of the aircraft in the tailplane incident at its home base noted, "pilots need to understand the importance of secondary damage". An engineer's way of looking at an aircraft is different from that of a pilot. The engineers see what goes on inside, how the aircraft structure and systems respond to 'fair wear and tear', and some that is 'unfair'.

In both of the above cases, when structures were hit hard, damage resulted. It is natural to look at the point of impact and possibly conclude that "it looks much the same", but the real test is "where did the loads – the forces go, and was there damage elsewhere?" The relatively light nature of aircraft structures does mean that damage **can** lie elsewhere. It may be hidden, but it is no less hazardous.

Hopefully, most pilots know that very heavy nose-gear landings ('crunches') can result in firewall damage via the attachment points. These do happen sometimes in training, and when a landing goes wrong – especially after a poor and unstable approach.

In the case of the microlight aircraft, the initiating heavy landing would not have gone unnoticed by the pilot (well, we hope not.

Continued over ...

... continued from previous page

Most of us know when we thump it on!) and the lean would have been evident at least on the level floor of the hangar. That was the time to fully investigate. It was a surprise that the aircraft passed aircraft condition inspections in this state, and that it took another independent authorised person to say, "This isn't right, we need to find out why and repair".

For the agricultural aircraft, the surprise was in the overlooked physics of the event. If you substantially load the outboard end of a tailplane, it is logical that much greater loads are placed on the fulcrum point (principle of levers), in this case the attachment fittings. A close engineering inspection was really the minimum requirement for continued safe flight. The airworthiness of the aircraft was potentially compromised, and despite 'the job at hand', the first duty of the pilot-in-command is to ensure airworthiness. Yes, it may be inconvenient, a delay, a perceived cost – but compare these factors with the cost of a fatality.

Summary

If you ding or dent your general aviation or microlight aircraft, or even suspect you have done it a serious injury, remember it isn't a car. It can't just break down on the side of the road. It can, however, fall out of the sky and take you with it. If something really goes 'bump in your flight' get it checked properly. Don't rely on it 'looking okay'. You may not know where the resultant damage may really be. Get the expert opinion of those who do really know **before** you fly. This will be a licensed engineer, or an appropriately authorised person.

Finally, the worst thing you can do if you 'ding', dent, or stress an aircraft, is to not report it to the owner/operator. All of aviation depends on a really high level of shared trust and responsibility. After all, it is highly likely that someone else will fly that plane, as you will also fly others. ■

Power Turbine Governor Underspeed

The Accident

On Sunday 30 November 2003, ZK-HCC, a Hughes 369HS helicopter, was on a scenic flight near the head of the Fox Glacier at 9500 feet, when the pilot noticed the engine power turbine speed (N_2) had reduced to 97% and the main rotor speed (N_R) to 456 rpm. (This was below the N_2 normal power-on operating range of 103% to 104% and 484-489 rpm for N_R.) The pilot checked that the throttle was fully open, and simultaneously lowered the collective lever to prevent any further reduction in turbine and rotor speed. As the helicopter descended, the pilot exercised the governor, or beep switch (an electrical switch on the collective lever that sets the power turbine to maintain N_2 as a specific speed between 97% and 104%) to try and regain N_2. At 6500 feet, N_2 increased to its normal setting, and the pilot increased power and flew the helicopter in normal flight.

Several minutes later the problem recurred. The pilot exercised the governor switch but was unable to increase N_2 above 97%. When the pilot raised the collective lever, N_2 decayed further. The pilot then lowered the collective, and prepared for an emergency landing at the base of the Fox Glacier. As the helicopter neared the ground, the pilot flared it to reduce forward speed and applied collective for an emergency landing. The helicopter levelled and then sank quickly, striking a large rock with the heel of its right skid. The skid broke, and the helicopter rolled onto its right side, coming to rest with the engine still running. The pilot shut off the fuel to the engine, and then assisted the front passengers from the helicopter. The four passengers on board suffered only minor injuries, and the pilot was uninjured.

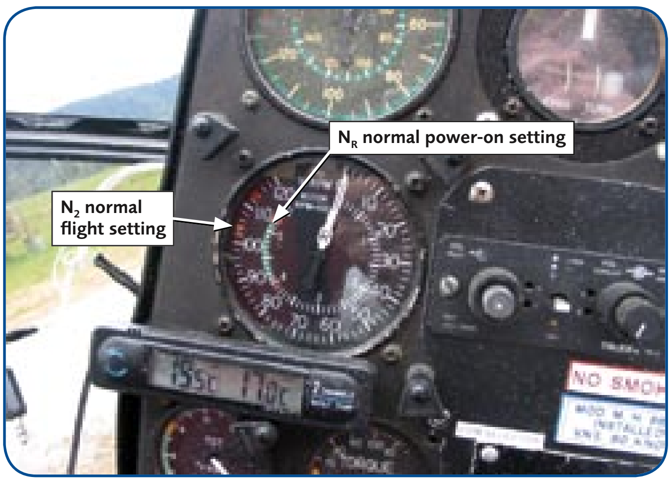


Photo courtesy of the Transport Accident Investigation Commission

Dual engine power turbine speed (N_2) and main rotor speed (N_R) tachometer.

Photo courtesy of the Transport Accident Investigation Commission

ZK-HCC after the accident at the base of the Fox Glacier

Analysis

Investigation revealed that a power turbine governor (PTG) underspeed occurred, when electrical continuity to the governor (beep) switch was lost. Two of the three electrical wires to the PTG switch had become detached during the flight. One broken terminal was for the power supply, and the other was for the beep-up (increase N_2) connection. A panel nut securing the switch to the collective lever was found to be loose, allowing movement of the switch body. Consequently there would have been a constant flexing of the wires, which eventually caused them to break at the soldered connections. The breakage resulted in N_2 reducing to its minimum power setting of 97%.

To prevent a recurrence in other Hughes 369 helicopters, it is recommended that pilots report any switch that appears loose on its mounting (particularly the PTG beep switch) to their maintenance engineer for rectification. Maintenance engineers should check the PTG beep switch for security at the next scheduled inspection. Any switch found to be loose should be thoroughly investigated, to determine the condition of its electrical connections. Any defects found should be reported to the CAA via form CA005 and rectified before further flight.

Governor Failure – Emergency Procedures

A PTG underspeed condition may be indicated by a simultaneous reduction in the power turbine speed and rotor rpm; there may also be an indication of a fluctuation in the turbine speed, and possible yaw. Typically, there will be an activation of the low rotor rpm horn or light, if fitted. The emergency actions will depend upon the type of helicopter, and the amount of time available.

For all helicopter types the safest action is to initially lower the collective, and adjust to maintain rotor rpm in the green range. If time and altitude permit, cross-check the engine instruments to establish the degree of power loss. It is possible that the turbine speed may stabilise at a low value, and there may still be sufficient power available. This can be confirmed by flying at the minimum power speed and making a partial-power check by progressively applying collective control. If the helicopter can maintain height at the reduced power setting it may be possible to make a reduced-power landing at a more suitable landing site. If time and altitude are insufficient, or the engine continues to lose power during the partial power check; then the autorotation should immediately be established.

In some helicopter types, such as the Hughes 369, the flight manual recommends (if time permits) that a partial-power check is carried out before committing to an autorotational landing. If the governor settles at its minimum setting (97 %), there may be enough power for a reduced power landing at a more suitable site. In the event of a governor failure in other types, for example, the Bell JetRanger; the manufacturer recommends lowering the collective to maintain rotor rpm, closing the throttle, and an autorotational power-off landing is carried out. Some instrument cross-checking should still be made, if time permits, to ensure that the problem is not just a tachometer failure.

In helicopters (such as the Aerospatiale 350) that have a manual fuel control position on the fuel control lever, it may be possible to recover from a governor underspeed, when altitude and time permit. In the event of a governor underspeed, the fuel control lever can be moved beyond the FLIGHT detent position, and into the EMERGENCY sector. This will progressively open the emergency control valve and override the governing of the power turbine. In this situation the pilot has to monitor the gas generator speed (N_g), rotor rpm, and the exhaust gas temperature (T_4), since the governing system no longer provides any protection. Each time the collective is moved, a compensating manual adjustment will be required in the fuel flow control to maintain parameters in the permitted operating range.

The fuel flow control lever placed in the EMERGENCY sector on an Aerospatiale 350 helicopter.

For information on how to handle a governor failure in your type of helicopter, refer to the emergency section in the flight manual.

Conclusion

A governor underspeed is a situation where the emergency procedures must be committed to memory. It is not a situation that allows time to locate the aircraft flight manual and refer to the appropriate section. If a governor underspeed is not simulated during your type rating or competency check, then ask your instructor to discuss the scenario with the aid of the flight manual. Make sure you are familiar with the possible instrument indications (as described) and the correct emergency actions relevant to your particular type of helicopter. ■

Reporting Instrument Defects

Incident reporting is an essential element of a flight safety system. The Civil Aviation Authority analyses incident investigation reports, in order to identify potential problem areas and to focus accurately on safety initiatives to benefit the aviation industry. Unfortunately, in some sections of the industry, only a small amount of incident reporting occurs.

The reporting of instrument defects that occur during flight is an area that could be improved. There appears to be confusion about whose responsibility it is to report instrument defects. Some pilots believe it is the engineer's responsibility and feel their duty is done when they inform their maintenance organisation of the problem. There have been cases, however, when engineers and maintenance organisations believed the pilot, or operator, had already reported the incident to the CAA and therefore did not report it.

Reporting Instrument Defects

Civil Aviation Rules, Part 12 *Accidents, Incidents and Statistics*, outlines the responsibilities for notifying, reporting, and investigating accidents and incidents. For instrument defects that occur during flight, there is no requirement to notify the incident as soon as practicable, but details must be provided to the CAA within 10 days by the certificate holder. Any aviation-related person who is involved in an incident must report it (Section 26 of the Civil Aviation Act), unless that person is sure that details have already been provided to the CAA by someone else. This means the pilot-in-command or the maintenance organisation are required to submit details if they are unsure whether the certificate holder has reported the incident to the CAA.

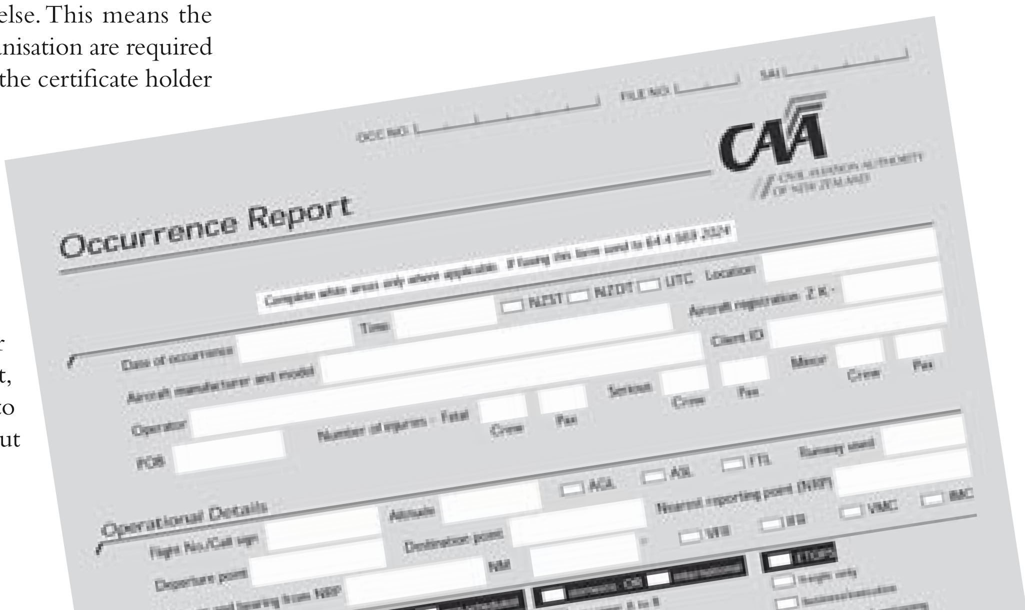
If you are an employee, it is better for you to tell your employer about the instrument defect and allow them to provide details to the CAA. That way, your employer can maintain an accurate picture of what is happening in their operation. If, however, you are in any doubt as to whether your employer has provided details of an incident, you should do so yourself (you may prefer to do this in confidence). If you are unsure about when to report an instrument defect, the best policy is to fill out a CA005, or telephone 0508 4 SAFETY (0508 472 338).

Certificated operators and organisations are responsible for maintaining safety standards in their own businesses. As part of this responsibility, they are required (under rule 12.59 *Investigation and reporting*) to investigate their own incidents. Operators have up to 90 days to complete the investigation and provide the results to the CAA. These too, can be submitted on form CA005.

Reporting Other Incidents

The onus of responsibility for reporting other incidents to the CAA may vary. For example, a serious incident is defined by rule 12.3 *Definitions* as an "incident involving circumstances indicating that an accident nearly occurred", and it must be notified to the CAA as soon as practicable by the certificate holder, or person involved. Airspace and bird incidents, however, are to be notified by the pilot-in-command, also as soon as practicable. Notification can be made by telephoning the CAA on 0508 4 SAFETY (0508 472 338).

For all other incidents, details should be submitted on the CA005 form within 10 days by the certificate holder or the pilot-in-command, depending on the type of incident. The certificate holder, however, is required to send an investigation report of the incident to the CAA within 90 days.



Reporting – General

Details or an investigation report of any incident can be submitted by form CA005. This form can be printed from the CAA web site, www.caa.govt.nz. When completed, forms can be emailed (ca005@caa.govt.nz), faxed (0–4–569 2024), or posted to FreePost 3901, Safety Investigation Unit, Civil Aviation Authority of New Zealand, P O Box 31–441, Lower Hutt.

If you are in doubt about your responsibilities, refer to the CAA web site under "Accidents and incidents", or contact the Safety Investigation Unit (0–4–560 9400). They will be happy to discuss any queries you may have. Ask for a copy of the CAA booklet *How to Report your Accidents and Incidents.*

All of this may sound like hard work, but it takes only a few minutes to notify the CAA of an incident. Your cooperation in notifying, reporting and investigating safety-related incidents is important in achieving a safer aviation environment. ■

More on Starting

In "Cautionary Tales on Starting" in the September/October 2004 issue of *Vector*, we provided advice on priming techniques and advised against priming with the throttle.

The article was focused on the correct use of a primer system, and it did not specifically address the situation for aircraft without a primer system.

A reader has pointed out that the Britten-Norman Islander engines, for instance, are primed with the throttle in accordance with flight manual instructions, and that the Lycoming operator's manual for this engine states that for carburettor engines without a primer, the throttle should be pumped two to three times to prime the engine.

There will be other aircraft types where priming the engine with the throttle may be the only method of priming. Where a primer system is fitted, it should be used.

A Lycoming "Key Reprints" on starting states: "An important part of the engine starting procedure is the priming technique involved. Of course, the pilot's operating handbook will specify the steps in starting a specific model engine. … Priming can be best accomplished with an engine priming system, as opposed to use of the throttle."

Another starting tip from Lycoming is worth repeating here.

"When an engine does not start easily, it can be frustrating. Of course this can occur at any time of the year, and it is very tempting to just keep grinding away with the starter in an attempt to get it going. Should this happen to you, relax. Take care of that starter, or it may fail. The general rule for starters is that they should be operated only for short periods and then allowed to cool. If engine start has not occurred after three 10-second periods of operation with a pause between each, a five-minute cooling off period is required. Without this time limit for operation and an adequate cooling off period, the starter will overheat and is likely to be damaged or to fail completely."

A popular feature in a safety magazine such as *Vector* is a share-your-experience type of article written by a pilot (or anyone else involved in aviation).

We would like to encourage further contributions, as these true-life events often contain important safety messages that we can all readily relate to and learn from.

It is appreciated that many people who have had an interesting experience sometimes don't have the time to write an article about it.

We can help. If you have had an experience that you think would make the basis for a good article, contact *Vector* (see below). One of the editors will assist you with the story. The draft article will be returned to you for comment or modification before it is published.

Some points to note:

The article can be anonymous and de-identified if that is what you prefer – the only persons who need to know your identity are the *Vector* editors who write and process your story.

You will have the final say on what is published, and if you don't like the article it won't be published at all.

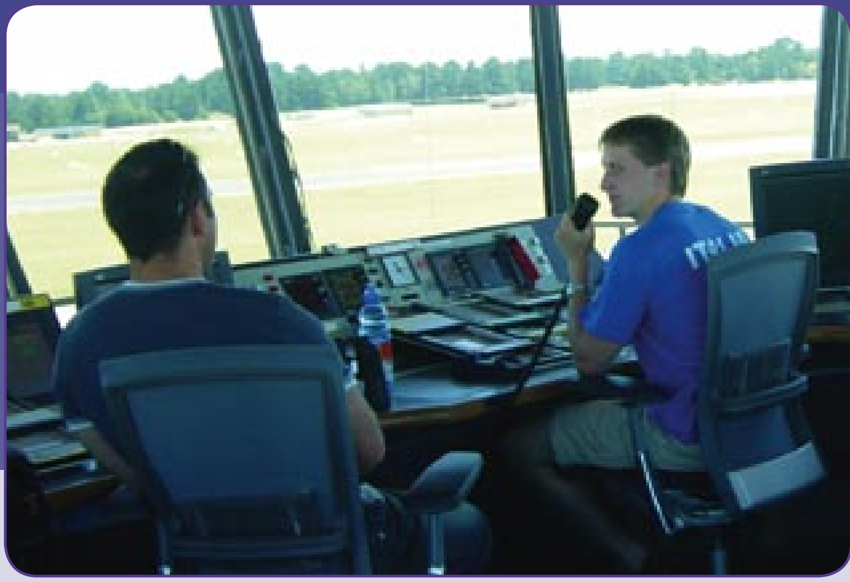
Vector will only write and publish an article if there is a valid flight safety message that can be taken from your experience.

If you have a story you would like to relate to assist others, then send it to:

Vector/CAA News Editor,
Communications and Safety Education Unit,
CAA, P O Box 31–441, Lower Hutt

or email: publications@caa.govt.nz.

Be Clear About ATC Clearances



Contributed by Ross St George, CAA Field Safety Adviser and Phil Granger, Chief Controller, Gisborne Tower

Complying with an Air Traffic Control (ATC) clearance is a critical safety action. Recent field reports, and incidents, indicate an increased number of aircraft taking off without an explicit clearance to do so. Pilots must understand that this can pose a high safety risk in terms of other aircraft operating in the vicinity, and for the required separations that ATC has to maintain with other aircraft.

Taking off without a clearance is an action guaranteed to get the controller's undivided attention. At a controlled aerodrome one must have a clearance to take off, and this clearance must be read back. If pilots have any doubts they must check. Be very aware that the ATC instruction to 'taxi, line-up and leave the control zone' is not a clearance to take off, unless such clearance is explicitly included. The read-back must then be accepted as correct. If it is not, it will be 'challenged' by being re-issued.

Similarly, other ATC clearances require as much attention. "Cleared to land" is obviously one. "Cleared to enter the Gisborne Control Zone, track to the Mill, not above 1500 feet and report at Manutuke" is another. Read-backs are required, as is adherence to the actual content of the clearance (not an approximation of it).

So, listen carefully, take note of the clearance content, read back to confirm that the message is 'received and understood', then conform to the clearance as issued. Don't assume, don't act if in doubt – and don't be embarrassed to check. You are not going to be 'shot down' if you use plain language to do so.

The structure and discipline of clear communications contributes to safe flying in aerodrome control zones.

Documents

The Civil Aviation Rules (CARs) are clear about instructions and clearances issued by ATC. Details are covered by rules 91.245 and 91.247, in regard to requiring a clearance – essentially an approval to operate in the airspace, and rule 91.225 sets out the requirements for ATC clearances when operating at an aerodrome where ATC is in attendance.

The 'ins and outs' of ATC clearances are set out in the *AIP New Zealand Volume 1*, in Section 8 of the ENR, *General Rules and Procedures*. Step-by-step communications procedures and phraseology are set out in Advisory Circular (AC) 91 -9.

Listen carefully to ATC instructions, take note of the clearance content, read back to confirm that the message is 'received and understood', then conform to the clearance as issued. If you are unable to comply with the clearance then inform ATC.

Revision

We encourage pilots who have any doubt as to the format and meaning of an ATC clearance to read and review the above documents with an instructor at their local aero club or flight school. This would be especially helpful to general aviation pilots who do not regularly fly into, and out of, controlled aerodromes and airspace. Understandably, these pilots become 'rusty' about procedures, and ATC instructions and clearances. There is also an opportunity at the Biennial Flight Review, for instructors to take up this topic for revision with pilots who rarely use controlled airspace and ATC attended aerodromes. ■

Are You the Owner of Your Aircraft?

It is common for aircraft to be operated by parties other than their financial owners. Depending on the length of time involved in sharing the aircraft between parties, the financial owner may not be the "owner" in terms of the Civil Aviation Act 1990. This article examines the legislation and definition of "owner" under the Act, and its implications for people entering into agreements to hire or lease aircraft.

Legislation

The Civil Aviation Act 1990 requires that "every person lawfully entitled to the possession of an aircraft for a period of 28 days or longer, which flies, to, from, within or over New Zealand territory shall register that aircraft and hold a valid certificate of registration for that aircraft". According to the Act, the definition of "owner", in relation to any aircraft, "includes any person lawfully entitled to the possession of the aircraft for 28 days or longer".

The aircraft will, therefore, only have one certificate at any given time, with one registered owner. If, however, the owner enters into an agreement to lease or lend the aircraft, then this agreement of entitlement to possession will be identified to the other party under a 'Terms of Agreement'. If this agreement is for 28 days or longer, then the person entitled to possession would be required to re-register the aircraft in their name or company.

This simply means that any person (or group of persons, or organisation of any kind), who leases or hires an aircraft and is given possession for 28 days or more, must register the aircraft in their name and hold a valid Certificate of Registration. This obligation holds from the moment the condition applies (for example, at the moment of signing a contract involving the aircraft hire for 28 days or longer), not just from the 28th day.

The purpose of this definition of 'owner' is to ensure the CAA has an up-to-date record of **the person who has control and responsibility for the maintenance and operation** of each New Zealand registered aircraft. This is primarily to ensure that continuing airworthiness information can be communicated in a timely fashion.

Financial considerations are of no interest for the purposes of the Act. Thus, the Certificate of Registration is merely an official record of the relevant entry on the New Zealand Register of Aircraft, and it is not in any way a certificate of title.

Change of Ownership

A change in ownership must be notified to the CAA within 14 days. The new owner does not receive a Certificate of Registration until it is applied for. The change of ownership is prepared by both the old and the new owner. They must complete the form printed on the reverse side of the existing Certificate of Registration and forward it to the CAA. The fee for this is $30. The form also embodies an application by the new owner for a Certificate of Registration.

It is an offence for a person, being the owner by definition, to operate an aircraft without holding a valid Certificate of Registration. If a person commits such an offence then they are liable (Section 46 of the Act) for imprisonment for up to 12 months, or a fine up to $10,000. If it is a company, the fine can be up to $100,000.

Scenarios

If a person purchases an aircraft, and sets up a hire agreement with another entity, for example, an aero club, and the terms of this agreement are longer than 28 days, then the aero club is, by definition, the owner of the aircraft and is responsible for its operation and maintenance. If the aero club then hires out the aircraft to a club member and the terms of agreement are for a period longer than 28 days, then the club member becomes the new owner (by definition) and is required by law to register the aircraft.

Occasionally, more than one person (in this scenario, club members) may have various oral or casual agreements to use the aircraft. In this situation, the aero club is responsible for having it registered, unless any of these arrangements is clearly beyond 28 days, in which case that person must register as the new owner.

Continued over ...

... continued from previous page

Lawful entitlement to possession in these circumstances will also depend on the nature of the agreement between the two parties.

When an operator requests the use of an aircraft from an owner at a different airfield for a period less than 28 days, then the owner is responsible for ensuring that the aircraft is registered. If this agreement between the parties is changed, and it is evident that the operator will have possession for more than 28 days, then the operator becomes the new owner and is required to register the aircraft.

Conclusion

If you enter into an agreement to operate an aircraft for a period longer than 28 days, then you become the owner of that aircraft under the terms of the Act. This is irrespective of whether or not you are the financial owner. You must obtain and maintain a Certificate of Registration. If you fail to do this, then you are liable for prosecution. You are advised, therefore, when entering into an agreement to use an aircraft, to ensure that the time period is clearly specified and that appropriate registration action is taken, if required. ■

Transition Layer Change

In the last issue of *Vector*, the article *Changes in the Air* gave a summary of recent major airspace changes. The article, which was aimed mainly at a VFR audience, stated that the change in the transition layer was made to reduce the number of altimetry settings required for regular VFR flights at these altitudes – in particular, parachute operations.

This is not the primary reason for the change.

The purpose of raising the transition layer was to:

- Raise the transition altitude above most of the minimum safe altitudes (MSA) on routes over mountainous areas in New Zealand and the highest volcanic special use airspace. This takes into account changes made to volcanic hazard zones which have raised some MSA and the establishment of new routes above 11,000 feet across the Southern Alps; and
- Allow unpressurised aircraft, such as parachuting and survey operations, to use the highest altitude authorised for use without oxygen.

The reasons for raising the transition layer were included in the NPRM (NPRM 04-01), issued in October 2003, which is the formal document for public and industry comment on Civil Aviation Rule amendment proposals. These reasons were detailed at some length in technical terms in the NPRM, whereas the *Vector* article was aimed mainly at the recreational flyer and how the changes would affect them. ■

New Video – *Passenger Briefing*

A new 18-minute video, *Passenger Briefing*, has recently been released, replacing our earlier version on the topic. In the opening scenes, the video dramatically demonstrates the importance of briefing passengers. Evidence from air safety investigations indicates that it is the well-prepared passenger who is most likely to escape from a wrecked aircraft or take the correct actions during an in-flight emergency. The extent to which passengers are well prepared is closely related to the advice given to them prior to the flight. Briefing passengers can also be reassuring, leading to an enjoyable flight for them, and perhaps a desire to repeat the experience.

The video does not provide a full passenger briefing checklist as such – this will vary depending on type of aircraft, type of operation, local circumstances, etc. Rather, it covers a wide range of factors to be considered as pilots or operators prepare and deliver their passenger briefings. The video will be of interest to all pilots and operators, no matter how small or large the aircraft or operation.

See the September/October 2004 issue of *Vector*, or visit our web site, www.caa.govt.nz, for a full list of safety videos available from the CAA.

To Borrow: The tapes may be borrowed, free of charge. Contact the CAA Librarian by fax (0–4–569 2024), phone (0–4–560 9400) or letter (Civil Aviation Authority, P O Box 31–441, Lower Hutt, Attention Librarian). **There is a high demand for the videos, so please return a borrowed video no later than one week after receiving it.**

To Purchase (except Outside Productions): Obtain direct from Dove Video, P O Box 7413, Sydenham, Christchurch. Email dovevideo@yahoo.com. Enclose: **$10 for each title** ordered; plus **$10 for each tape** and box (maximum of 4 hours per tape); plus a **$5 handling fee** for each order. All prices include GST, packaging and domestic postage. Make cheques payable to "Dove Video".

Planning an Aviation Event?

Do you have a significant event or airshow coming up soon? If so, you need to have the details published in an AIP *Supplement* rather than relying on a NOTAM. (Refer to AC 91–1 *Aviation Events* for operational requirements.) The information must be promulgated in a timely manner, and should be submitted to the CAA with adequate notice. Please send the relevant details to the CAA (ATS Approvals Officer or AIS Coordinator) at least one week before the appropriate cut-off date indicated below.

Supplement Cycle	*Supplement* Cut-off Date (with graphic)	*Supplement* Cut-off Date (text only)	*Supplement* Effective Date
05/04	04 Feb 2005	10 Feb 2005	14 Apr 2005
05/05	04 Mar 2005	10 Mar 2005	12 May 2005
05/06	01 Apr 2005	07 Apr 2005	09 Jun 2005

How-to... fill the gap

GOOD AVIATION PRACTICE

The CAA publishes two series of information booklets.

The **How-to…** series aims to help interested people navigate their way through the aviation system. The following titles have been published so far:

Title	*Latest Version*
How to Be a Pilot	2000
How to Charter an Aircraft	1999
How to Deal With an Aircraft Accident Scene	2001
How to Establish a Small Aerodrome (web only)	2002
How to Get Your Licence Recognised in New Zealand (web only)	2000
How to Navigate the CAA Web Site	2000
How to Report Your Accidents and Incidents	2002

The **GAP** (**G**ood **A**viation **P**ractice) series aim to provide the best safety advice for pilots. The following titles have been published so far:

Title	*Latest Version*
Aircraft Icing Handbook	2000
Bird Hazards	2003
Chief Pilot	2000
Flight Instructor's Guide	2003
Fuel Management	2002
Helicopter Performance	2002
In, Out and Around Milford	2002
In, Out and Around Queenstown	2004
In, Out and Around Auckland	2004
Mountain Flying	1999
New Zealand Airspace	2004
Secure Your Aircraft	2004
Takeoff and Landing Performance	2002
Wake Turbulence	2003
Weight and Balance	1999
Winter Flying	2001

How-to… and **GAP** booklets (except *Flight Instructor's Guide* or *Aircraft Icing Handbook*) are available free from most aero clubs, training schools or from Field Safety Advisers (FSA contact details are usually printed in each issue of *Vector*). Alternatively, you can request them by email: info@caa.govt.nz.

Bulk orders (except *Flight Instructor's Guide* or *Aircraft Icing Handbook*) can be obtained from:

Communications and Safety Education
Civil Aviation Authority, P O Box 31-441, Lower Hutt. Tel: 0–4–560 9400

*The ***Flight Instructor's Guide*** and ***Aircraft Icing Handbook*** can be purchased from either:

- **Expo Digital Document Centre**, P O Box 30–716, Lower Hutt. Tel: 0–4–569 7788, Fax: 0–4–569 2424, Email: expolhutt@expo.co.nz
- **The Colour Guy**, P O Box 30–464, Lower Hutt. Tel: 0800 438 785, Fax: 0–4–570 1299, Email: orders@colourguy.co.nz

New GAP Booklet – *Secure Your Aircraft*

A new title in the "Good Aviation Practice" series has been published, titled *Secure Your Aircraft*.

Aerodromes around New Zealand can experience strong wind conditions, which can result in damage to unsecured or inadequately secured aircraft. It is advisable to ensure that your aircraft is secured when leaving it parked in the open for any period of time. *Secure Your Aircraft* provides information on types of tiedowns, tying-down techniques, and suitable tiedown knots that can be used to secure your aircraft. It also covers tying down of multi-engine aircraft, helicopters, floatplanes and skiplanes.

Aircraft owners, operators and pilots should ensure that they know the correct method for securing their particular aircraft. This booklet is a useful general reference tool on the topic.

Accident Notification

24-hour 7-day toll-free telephone

0508 ACCIDENT
(0508 222 433)

The Civil Aviation Act (1990) requires notification "as soon as practicable".

Aviation Safety Concerns

A monitored toll-free telephone system during normal office hours.
A voice mail message service outside office hours.

0508 4 SAFETY
(0508 472 338)

For all aviation-related safety concerns

Field Safety Advisers

Don Waters
(North Island, north of line, and including, New Plymouth-Taupo-East Cape)
Tel: 0–7–823 7471
Fax: 0–7–823 7481
Mobile: 027–485 2096
Email: watersd@caa.govt.nz

Ross St George
(North Island, south of line New Plymouth–Taupo–East Cape)
Tel: 0–6–353 7443
Fax: 0–6–353 3374
Mobile: 027–485 2097
Email: stgeorger@caa.govt.nz

Murray Fowler
(South Island)
Tel: 0–3–349 8687
Fax: 0–3–349 5851
Mobile: 027–485 2098
Email: fowlerm@caa.govt.nz

Owen Walker
(Maintenance, North Island)
Tel: 0–7–866–0236
Fax: 0–7–866–0235
Mobile: 027–244 1425
Email: walkero@caa.govt.nz

Bob Jelley
(Maintenance, South Island)
Tel: 0–3–322 6388
Fax: 0–3–322 6379
Mobile: 027–285 2022
Email: jelleyb@caa.govt.nz

OCCURRENCE BRIEFS

Lessons for Safer Aviation

The content of *Occurrence Briefs* comprises notified aircraft accidents, GA defect incidents, and sometimes selected foreign occurrences, which we believe will most benefit operators and engineers. Individual Accident Briefs, and GA Defect Incidents are now available on CAA's web site, www.caa.govt.nz. Accident briefs on the web comprise those for accidents that have been investigated since 1 January 1996 and have been published in *Occurrence Briefs*, plus any that have been recently released on the web but not yet published. Defects on the web comprise most of those that have been investigated since 1 January 2002, including all that have been published in *Occurrence Briefs*.

Accidents

The pilot-in-command of an aircraft involved in an accident is required by the Civil Aviation Act to notify the Civil Aviation Authority "as soon as practicable", unless prevented by injury, in which case responsibility falls on the aircraft operator. The CAA has a dedicated telephone number 0508 ACCIDENT (0508 222 433) for this purpose. Follow-up details of accidents should normally be submitted on Form CA005 to the CAA Safety Investigation Unit.

Some accidents are investigated by the Transport Accident Investigation Commission, and it is the CAA's responsibility to notify TAIC of all accidents. The reports that follow are the results of either CAA or TAIC investigations. Full TAIC accident reports are available on the TAIC web site, www.taic.org.nz.

ZK-RPR, Europa XS, 18 Jul 03 at 12:15, Whakatane. 1 POB, injuries nil, damage minor. Nature of flight, private other. Pilot CAA licence CPL (Aeroplane), age 55 yrs, flying hours not known.

The aircraft ground-looped during the landing. The propeller and wing tip were subsequently damaged.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 03/2104

ZK-CMW, Cessna 185B, 17 Dec 03 at 19:00, Thames aerodrome. 1 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence PPL (Aeroplane), age 53 yrs, flying hours 430 total, 156 on type, 4 in last 90 days.

The pilot reported that after the aircraft had touched down and was at the end of the landing roll, it overturned and flipped onto its back. The pilot believed that the brakes had failed to release.

Main sources of information: Accident details submitted by pilot.

CAA Occurrence Ref 03/3696

ZK-TAY, Cessna A152, 16 Jan 04 at 14:45, Tauranga. 1 POB, injuries nil, damage substantial. Nature of flight, training solo. Pilot CAA licence nil, age 65 yrs, flying hours 148 total, 28 on type, 18 in last 90 days.

The student pilot was completing solo circuit consolidation. Four circuits were completed successfully but on the next one the pilot landed flat and the aircraft bounced. The pilot thought that he could control the landing as opposed to going around and on the third bounce the nose gear collapsed with the aircraft coming to rest on the runway.

Main sources of information: Accident details submitted by operator.

CAA Occurrence Ref 04/110

ZK-HDZ, Hughes 369D, 17 Jan 04 at 11:15, Cheviot. 1 POB, injuries nil, damage substantial. Nature of flight, agricultural. Pilot CAA licence CPL (Helicopter), age 40 yrs, flying hours 7985 total, 140 on type, 83 in last 90 days.

During agricultural operations the pilot noticed that the aircraft was losing power. He elected to carry out a precautionary landing, during which "popping noises" were heard coming from the engine, followed by a complete power failure. A heavy landing and rollover occurred. It was determined that the engine failure was caused by fuel starvation. The aircraft was inspected and found to have a defective fuel quantity indicating system. The "wheatstone bridge" in the fuel gauge cluster was reported to have a faulty resistor.

This defect was probably responsible for the erroneous fuel quantity indications. The low level warning light either didn't operate correctly or was not noticed by the pilot. The engineers advise that the defect in the fuel gauge is probably due to ageing and recommend that the gauges are checked annually as a precaution.

Main sources of information: Rescue Coordination Centre.

CAA Occurrence Ref 04/113

ZK-HLD, Robinson R22 Beta, 5 Feb 04 at 08:30, Waiotahi Beach. 2 POB, injuries nil, damage substantial. Nature of flight, private other. Pilot CAA licence CPL (Helicopter), age 46 yrs, flying hours 4105 total, 1859 on type, 73 in last 90 days.

The helicopter had an engine failure during cruise on a ferry flight. A forced landing was attempted on a beach. The aircraft rolled over on landing, due to the soft sand, causing substantial damage. Water was discovered in the fuel system. Water checks and refuelling had been carried out during the pre-flight. Exceptionally heavy rain had occurred the previous night.

Main sources of information: Rescue Coordination Centre.

CAA Occurrence Ref 04/342

GA Defect Incidents

The reports and recommendations that follow are based on details submitted mainly by Licensed Aircraft Maintenance Engineers on behalf of operators, in accordance with Civil Aviation Rule, Part 12 *Accidents, Incidents, and Statistics*. They relate only to aircraft of maximum certificated takeoff weight of 9000 lb (4082 kg) or less. These and more reports are available on the CAA web site, www.caa.govt.nz. Details of defects should normally be submitted on Form CA005 to the CAA Safety Investigation Unit.

The CAA Occurrence Number at the end of each report should be quoted in any enquiries.

Key to abbreviations:

AD = Airworthiness Directive
NDT = non-destructive testing
P/N = part number
SB = Service Bulletin
TIS = time in service
TSI = time since installation
TSO = time since overhaul
TTIS = total time in service

Bell 206B
RPM tacho gauge

The pilot reported intermittent rpm tacho gauge readings. The tacho gauge was found to be faulty and was replaced with a serviceable unit.

ATA 7700 CAA Occurrence Ref 03/3749

Cessna 207
Drag link rear bolt

It was reported that, during a scheduled inspection of the nose undercarriage, the rear drag strut bolt was found to be broken. A new bolt was fitted. The engineer recommended replacing the bolt every 3000 hours. TTIS 7926 hours.

ATA 3220 CAA Occurrence Ref 04/2150

Cessna 402C
Wiring connector

It was reported that the aircraft experienced moderate turbulence and was unable to maintain 10,000 feet. The pilot requested radar vectors to avoid the turbulence. During a turn, the righthand fire detection light illuminated. The pilot then immediately requested a clearance to divert. There was no visible sign of fire on either engine with no abnormal gauge indications. Before landing the light extinguished. The engineer found a fault with the fire detection harness, shorting out an indicator wire within the loom.

ATA 2611 CAA Occurrence Ref 04/2685

Fletcher FU24-950M
Textron Lycoming IO-720-A1B gear bolts

During installation into an IO-720 engine, the cam gear attachment bolts failed to make torque. Further investigation revealed that as they were being tightened the bolt threads had stripped. This was the third reported occurrence of this problem since 2002. Engineers commented that the engine manufacturer had in the past changed the appearance of the bolt to a more silvery cadmium coating. Since this change, the bolts had become less reliable in respect of achieving the required torque figure. The engine manufacturer was advised, and they responded that checks carried out at the factory did not reveal any problems, that they had no other reports of in-service failures worldwide, and that any substandard bolts will be detected at installation should they fail to make torque. The situation is still under investigation and is being monitored through the reporting system. This serves to highlight that extra vigilance should be used when installing these bolts.

ATA 8500 CAA Occurrence Ref 04/1629

KHI Kawasaki-Hughes 369HS
Tail rotor pitch link

A crack was noticed in the eye end of the tail rotor pitch link during a maintenance inspection. Further detailed inspection determined that the crack had initiated in the area of paint damage. Pitting corrosion had developed, and the crack had propagated through stress corrosion. The crack had penetrated completely through the cross section of the eye end. The localised paint damage was probably either as a result of being chipped or a poor paint application process. This highlights the importance of ensuring the integrity of the paint finish on critical components, and taking time to perform a good visual inspection for this type of damage.

ATA 6720 CAA Occurrence Ref 03/2854

Pacific Aerospace Cresco 08-600
Aileron control cable

The engineer reported that the aileron cables were found very badly worn, with a large number of broken strands. The damage had occurred in the centre wing fairlead location, not seen during routine inspections. New cables were installed. A CAA investigation involving the reporting organisation and the aircraft manufacturer resulted in the issue of an Airworthiness Directive, which required a detailed inspection of cables in the critical area. A defect report has since been received detailing cable wear in the area concerned. TTIS 1794 hours.

ATA 2710 CAA Occurrence Ref 04/107

Partenavia P-68B
Oil line fitting

A 45-degree elbow fitting between the oil cooler and the oil line failed in flight, causing an oil loss from the right engine. Investigation found that the oil line was too short and therefore held too rigidly in place. This allowed normal engine vibration to cause the failure.

ATA 7920 CAA Occurrence Ref 03/3051

Piper PA-38-112
Front left cylinder

After a maximum performance takeoff and approaching an altitude of 500 feet, the engine appeared to be slowly losing power and began to run roughly. Inspection after a precautionary landing revealed that the lower spark plug had blown out of the left front cylinder. TSO 1930 hours, TTIS 6200 hours.

ATA 8530 CAA Occurrence Ref 04/2337